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Title: The First 20 Years Los Alamos Scientific Laboratory, 1943-1963

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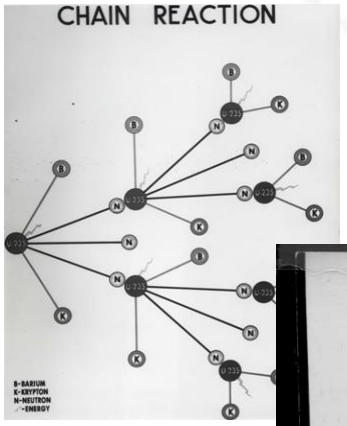
# The First 20 Years

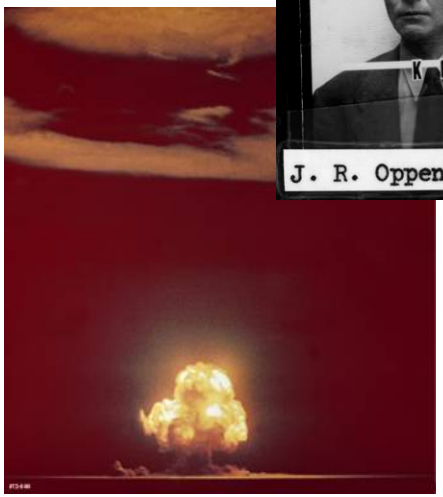
Los Alamos Scientific Laboratory, 1943-1963

# In the Beginning


- Fission was first produced in Nazi Germany in 1938
- Einstein, at the urging of Leo Szilard, warned FDR in August 1939
- In September 1939, the Germans ***and*** the Soviets invaded Poland
- Japan attacked Pearl Harbor on December 7, 1941
- In April 1943, the first technical conference was held in Los Alamos
- Two types of nuclear bombs were completed in ~28 months
- The world's first nuclear test was conducted on July 16, 1945
- The Trinity test achieved a yield equivalent to 21,000 tons of TNT

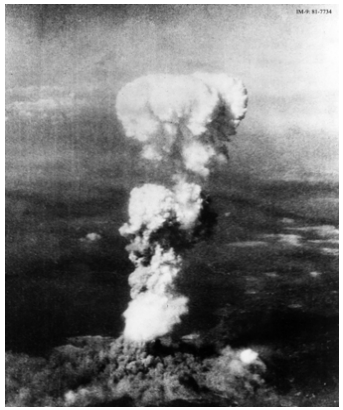




# The End of World War II

- On August 6, 1945 Hiroshima was bombed (LB = 15 kt)
- 64,500 had died by mid-November 1945
- On August 8th the Soviet Union declared war on Japan
- On August 9th Nagasaki was bombed (FM = 21 kt)
- 39,214 had died by mid-November 1945
- An armistice was declared on August 14th
- Los Alamos received the Army-Navy “E” Award for excellence in wartime production on October 16th



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# The Human Cost of a World War

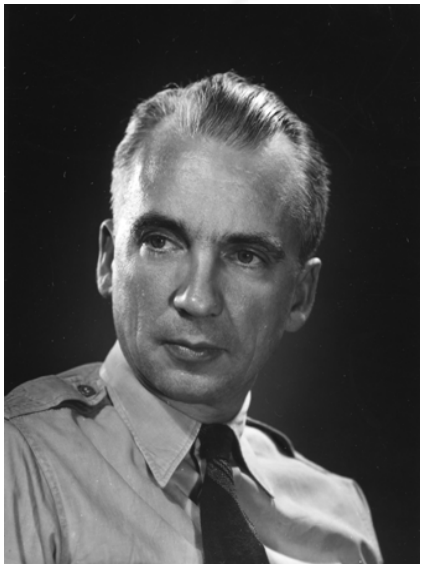
| | |
|---|---|
| American Fatalities: | 418,500 |
| Soviet Fatalities: | As many as 27,000,000 |
| American Pearl Harbor Fatalities: | 2,402 |
| Stalingrad *Casualties*: | 2,000,000 |
| American D-Day Fatalities: | 2,499 |
| Operation Meetinghouse (Tokyo) Fatalities: | 100,000 |
| Hiroshima Fatalities: | 64,500 had died by mid-November 1945 |
| Nagasaki Fatalities: | 39,214 had died by mid-November 1945 |
| Jewish Holocaust Fatalities: | 5,900,000 |
| Chinese Fatalities | As many as 20,000,000 |

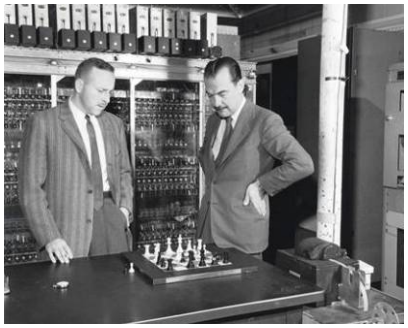
"A single death is a tragedy, a million deaths is a statistic."

Joseph Stalin

**WORLD WAR II CLAIMED BETWEEN 60 AND 80 MILLION LIVES**

# Bradbury's Laboratory





los alamos
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- Norris Bradbury was named Oppenheimer's successor
- He created a future for the Lab:

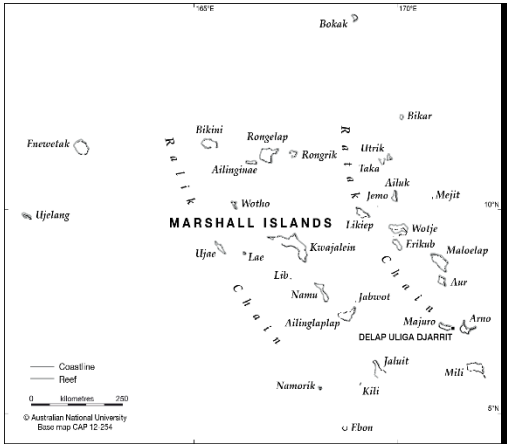
  1.) *We will set up the most nearly ideal project we can.*

  2.) *We will not discontinue weapon research until it is clearly indicated that this can be done.*

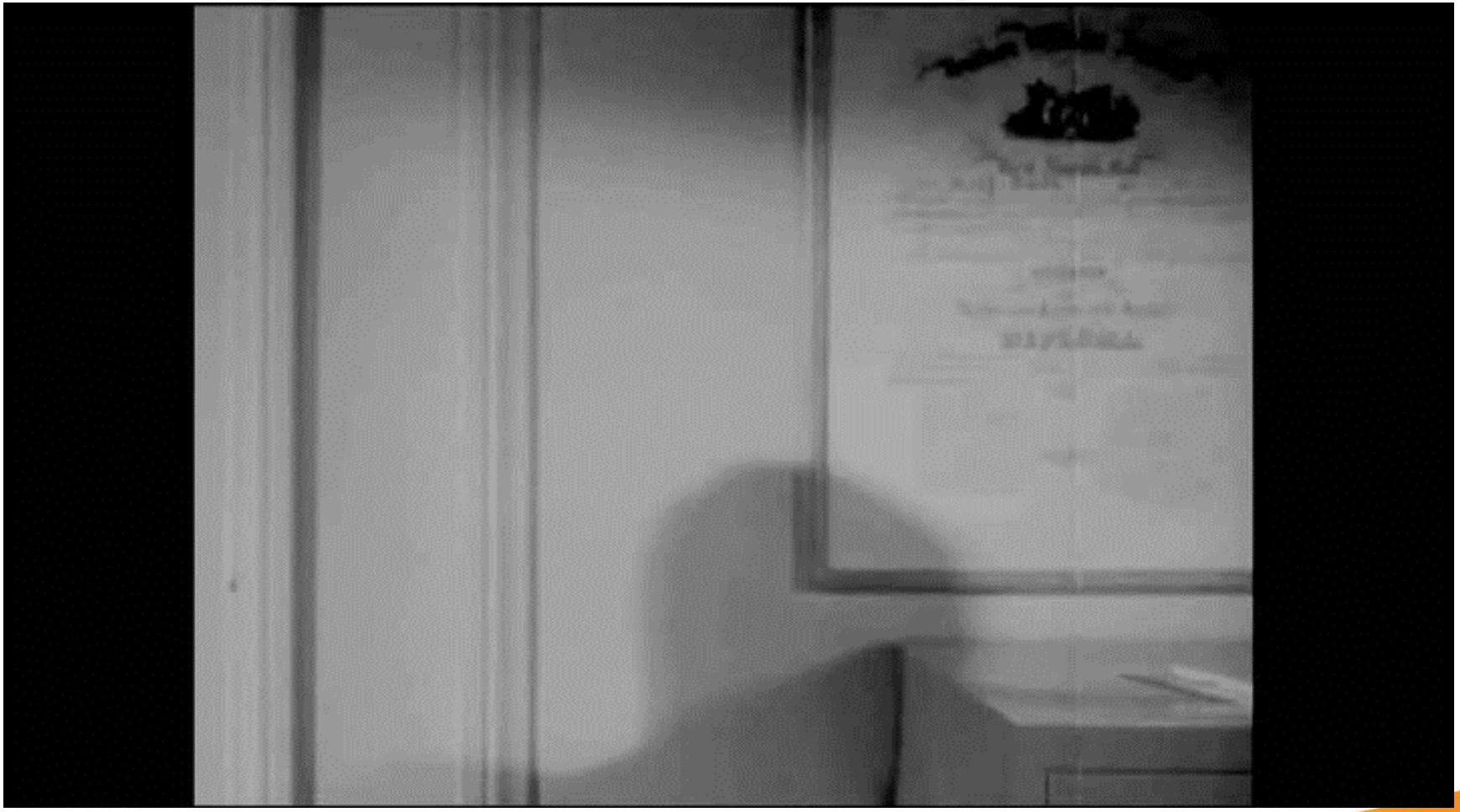
  3.) *We will decrease the project in size so that it can be accommodated on the mesa on a civilian basis.*
- Bradbury served as Director from 1945 to 1970
- He rebuilt the Laboratory physically and intellectually

# Operation Crossroads


- The Laboratory needed a customer
- After the war, the Navy wanted to see if a fleet could survive a nuclear strike
- Dubbed Operation Crossroads, the Navy used two weapons against a fleet of obsolete US ships and captured Axis boats in the summer of 1946
- Crossroads was purely a weapons effects series: it did not advance design
- A relatively small number of ships sank, but many were heavily irradiated




# “C” is for Communism



# The Cold War Escalates


- The Soviets had a pre-war history of aggression
- The Berlin Blockade: June 1948 to May 1949
- The first Soviet atomic bomb was tested in August 1949
- 1950 witnessed the end of the Chinese Civil War and the beginning of the Korean war
- A Soviet spy ring operating in the US was exposed in 1950
- In the later 1950s, public fears were stoked by the Bomber Gap, the Missile Gap, and Sputnik

THE EFFECT OF THE SOVIET POSSESSION OF ATOMIC BOMBS ON THE SECURITY OF THE UNITED STATES

POSSIBILITY OF DIRECT SOVIET MILITARY ACTION DURING 1948

"The Strategic Value to the USSR of the Conquest of Western Europe and the Near East (to Cairo) prior to 1950."

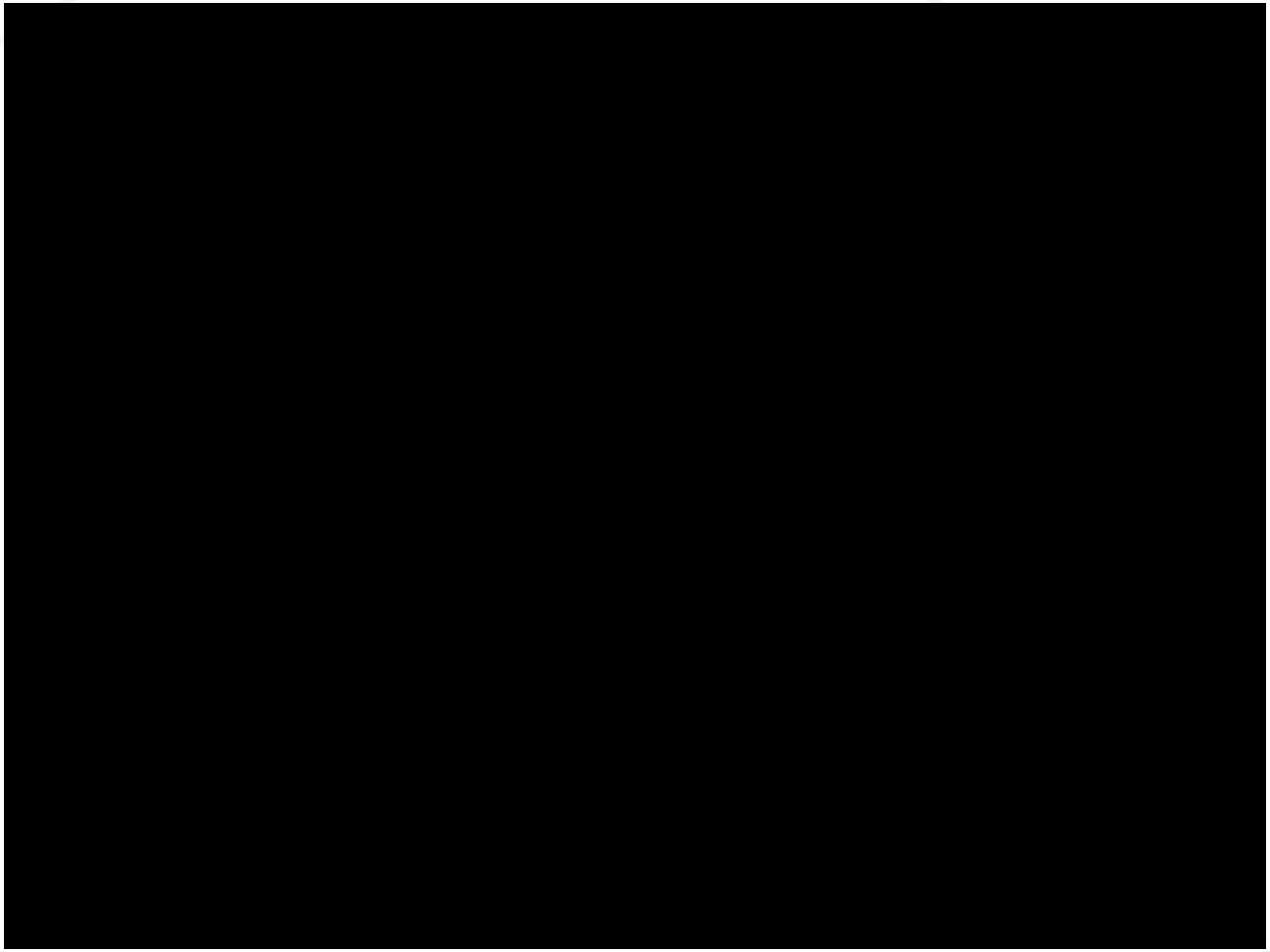
# The “Golden Age” of Nuclear R&D

- The nation’s stockpile grew from 2 to 31,255 weapons between ‘45 and ‘67
- During that same time, the United States conducted more than 500 nuclear tests
- When Joe-1 was conducted (1949) the US had 170 weapons in stockpile
- The year Stalin died (1953) the US had 1169 stockpiled weapons
- The first thermonuclear test was conducted on October 31, 1952
- The first tactical nuclear weapon was tested in May 1953

“Shortly after World War II the U.S. was in a position, having a nuclear monopoly, to annihilate any country completely without fear of any similar counter-attack. It was undoubtedly unique in the history of mankind that a nation had this capability and did not take advantage of it.”

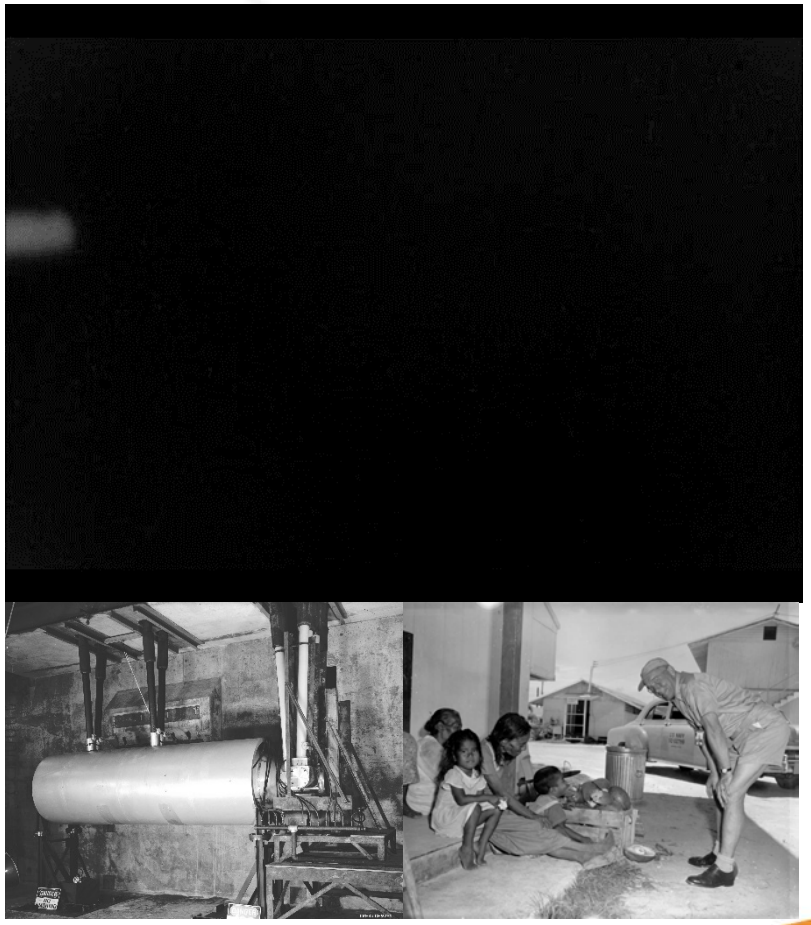
Harold M. Agnew

# “We’re in the thermonuclear era…”

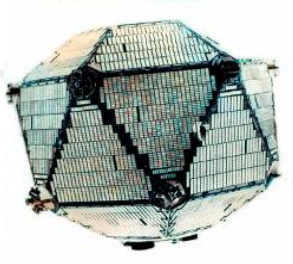


# Castle-Bravo to the Moratorium

- In February 1954, the US conducted its largest test: Castle-Bravo
- It was expected to produce a 6 Mt yield, but actually produced 15 Mt
- 15 Mt = **1000** Little Boy-type bombs
- ~236 Marshallese Islanders were overexposed to radiation and evacuated on an emergency basis
- The danger of fallout was gradually eclipsing the Soviet Union as a threat to the public
- In 1958, the Soviet Union and United States entered into a voluntary testing moratorium



# An Expanding Mission



- In the late 1950s, the Laboratory began to diversify its mission
- Under Bradbury, Los Alamos became a nuclear science laboratory:

The development of nuclear powered rockets for space exploration (Project ROVER)

The development of nuclear verification technologies (Vela, CORRTEX etc.)

Controlled thermonuclear fusion research (Project SHERWOOD, SCYLLA)

Industrial applications for nuclear explosions (Operation PLOWSHARE)

Health Physics research

Subatomic exploration

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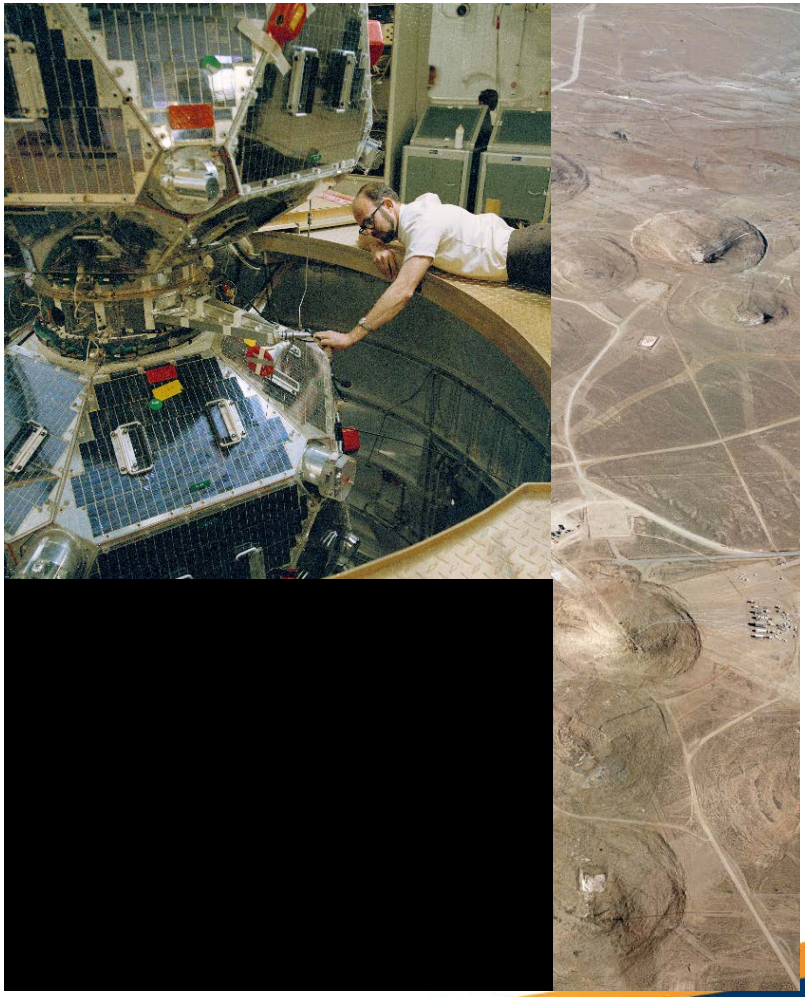
# The Cold War Nearly Turns Hot

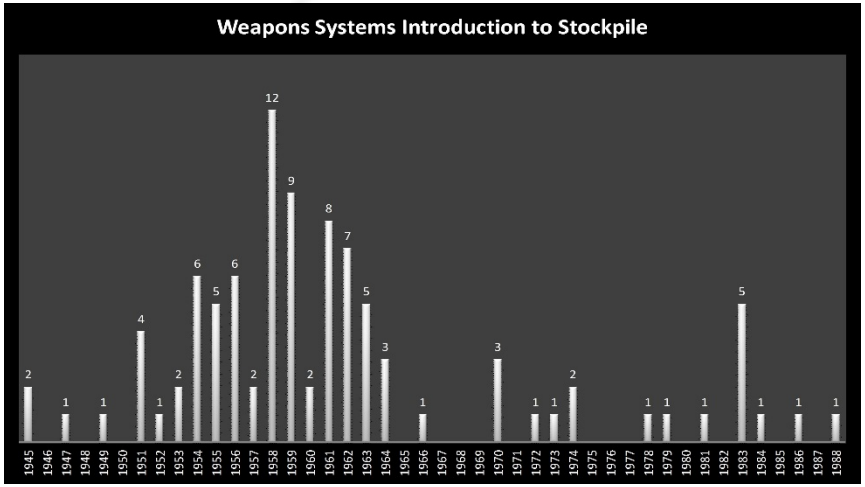

- In April 1961 the Bay of Pigs invasion of Cuba failed
- Construction on the Berlin Wall started in August 1961
- The Soviets abrogated the testing moratorium September 1, 1961 by initiating the largest test series in history: 57 tests in 65 days
- On September 15, 1961 the United States resumed testing
- The Soviets tested the Tsar Bomba (~50 Mt) October 30, 1961
- The Cuban Missile Crisis unfolded one year later

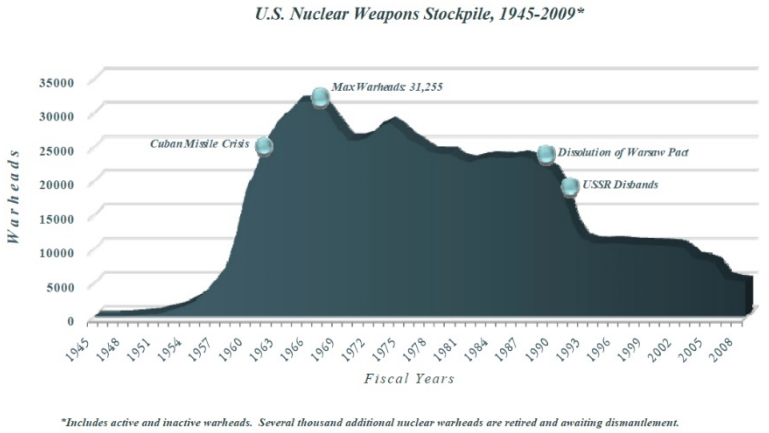
# The End of Atmospheric Testing

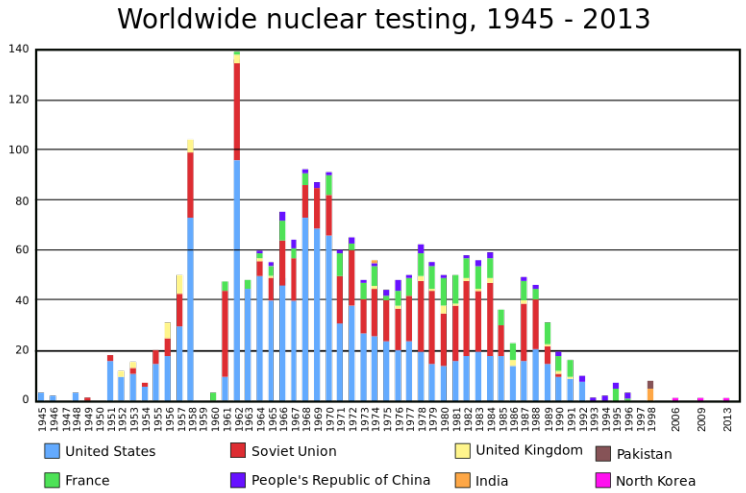
- Between 1945 and 1992, the United States conducted over a thousand nuclear tests
- 215 of those tests were conducted in the atmosphere or underwater
- 106 tests (all atmospheric) were conducted in the Pacific
- 3 tests were conducted in New Mexico
- The *last* atmospheric US nuclear test, Dominic-Tightrope, was conducted November 4, 1962
- The Partial Test Ban Treaty entered into force October 10, 1963
- LASL-developed Vela satellites were launched October 17th



# The Stockpile in Charts




**Hardtack-Oak**

6/28/58
Enewetak Atoll
8.9 Mt



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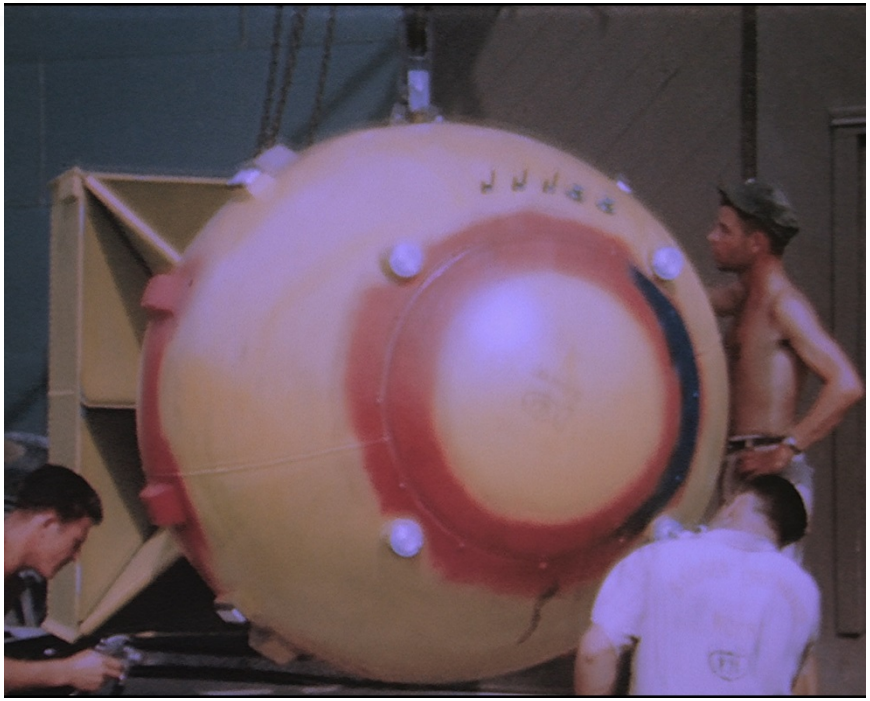
# The US went from

## THIS to THIS



# In less than 20 years!

**(1945 – 1963)**

# A Tradition of Innovation

**1945**: Los Alamos scientists conduct the world's first nuclear test

**1945**: Nuclear weapons developed at Los Alamos help end World War II

**1946**: The Monte Carlo method devised by LASL scientists

**1946**: LASL completes the world's first plutonium-fueled reactor

**1951**: First underground nuclear test conducted by LASL

**1951**: LASL conducts the first nuclear test producing thermonuclear burn

**1952**: LASL conducts the first full-scale thermonuclear test

**1953**: LASL conducts the first tactical nuclear weapon test

**1954**: The largest United States nuclear test conducted by LASL

**1956**: The existence of the neutrino proven by LASL scientists

**1963**: The heat pipe is invented by LASL scientists

**1963**: LASL-developed Vela satellites launched

**1967**: Gamma-ray bursts first detected by Vela satellites

**1972**: LAMPF produces an 800 MEV beam

**1973**: LASL's Nuclear Safeguards Program begins

**1974**: LAMPF ships its first medical radioisotopes

**1979**: IHE first used in a stockpiled nuclear weapon

**1982**: GenBANK established at LANL

**1982**: LANL's Cray X-MP named world's fastest computer

**1984**: LANL x-ray detectors used on GPS satellites

**1988**: Center for Genome Studies established at LANL

**1988**: LANL participates in Joint Verification Experiment

**1990**: National High Magnetic Field Laboratory established at LANL

**1990**: LANL begins participation in experiments that ultimately confirm neutrino mass

**1992**: LANL conducts the last US nuclear weapons test

**1995**: Chromosome 16 is mapped at LANL

**2002**: The first 3D full-system weapons simulation is performed at LANL

**2008**: LANL's Roadrunner supercomputer breaks the petaflop barrier

**2009**: DARHT becomes the world's most powerful x-ray machine

**2012**: LANL scientists produce a 100T non-destructive magnetic field

**2012**: Curiosity Rover lands on Mars equipped with LANL instruments

**2015**: LANL scientists develop a breakthrough portable medical MRI device